THOR
MANUFACTURING

THPS-600R Series
Pure Sine Wave Inverter
User's Manual

CE c UL US LISTED e13 020866

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1. Important Safety Information

WARNING!

Before installing and using the Inverter, you need to read Following safety information carefully.

1-1. General Safety Precautions

1-1-1. Do not expose the Inverter to water, mist, snow, or dust. To reduce the risk of hazard, do not cover or obstruct the ventilation shaft. Do not install the Inverter in a zero-clearance compartment. Overheating may occur.

1-1-2. To avoid the risk of fire and electronic shock, make sure that existing wiring is in good electrical condition and not undersize. Do not operate the Inverter with damaged or substandard Wiring.

1-1-3. There are some components in the inverter can cause arcs and sparks. To prevent from fire or explosion, do not put batteries, flammable materials, or anything should be ignition–protected around the inverter.

1-2. Precautions When Working with Batteries

1-2-1. If battery acid contacts your skin or clothing, you need to wash it out immediately with soap and water. If acid enters into your eyes, immediately flush your eyes with running cold water for at least 20 minutes and get medical attention immediately.

1-2-2. Never smoke or make a spark or flame in the vicinity of batteries or Engines.

1-2-3. Do not drop a metal tools on the battery. The resulting spark or short-circuit on the battery or other electrical parts may cause an explosion.

1-2-4. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery,
A lead-acid battery may produce a short-circuit current who's temperature is high enough to weld these metal items and cause a severe burn.

2. Features

Pure sine wave output (THD < 3%)

Output frequency：50 / 60Hz switch selections

Input & output fully isolated design

High efficiency 88~94%

Driving highly reactive & capacitive load at start moment.

Tri-Color indicators show input voltage & output load level

Loading controlled cooling fan

Advanced microprocessor

Protection：Input low voltage　Overload　Short circuit

Low battery alarm　Input over voltage　Over temperature

2-1. Applications

2-1-1. Power tools – circular saws, drills, grinders, sanders, buffers, weed and hedge trimmers, air compressors, etc.

2-1-2. Office equipment – computers, printers, monitors, facsimile machines, and scanners, etc.

2-1-3. Household appliances – vacuum cleaners, fans, fluorescent and incandescent lights, shavers, sewing machines, etc.

2-1-4. Kitchen appliances – microwave ovens, refrigerators and freezers, coffee makers, blenders, ice makers, toasters, etc.

2-1-5. Industrial equipment – metal halide lamp, high – pressure sodium lamp, etc.

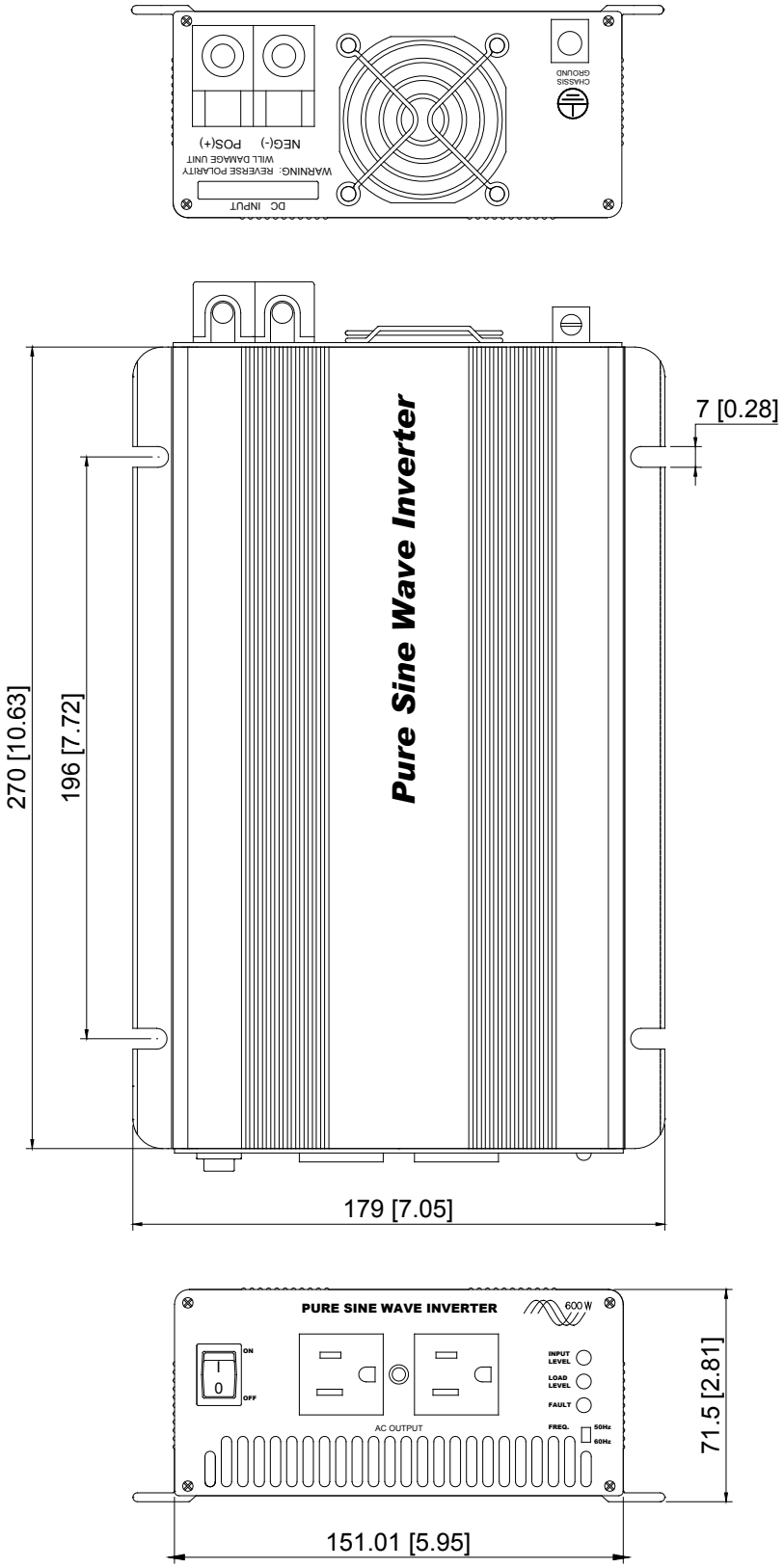
2-1-6. Home entertainment electronics – television, VCRs, video games, stereos, musical instruments, satellite equipment, etc.

2-2. Electrical Performance

Specification	Model No.					
Item	THPS-600R-12	THPS600R-24	THPS-600R-48	THPS-600R-212	THPS-600R-224	THPS-600R-248
Continuous Output Power	600W					
Maximum Output Power (3Min.)	680W					
Surge Rating	800W					
Input voltage	12V	24V	48V	12V	24V	48V
Output Voltage	100 / 110 / 120V +/- 5%			220 / 230 / 240V +/- 3%		
Frequency (Switch Selections)	50 / 60Hz +/- 0.05%					
Efficiency (full load)	87.0%	90.0%	92.0%	90.0%	93.0%	94.0%
No Load Current Draw	0.87A	0.43A	0.23A	0.83A	0.43A	0.22A
Output Waveform	Pure Sine Wave (THD < 3%)					
Output voltage Regulation	100 / 110 / 120V RMS -10%/+4%			220 / 230 / 240V RMS -10%/+4%		
Input Voltage Regulation	10.5-15 VDC	21.0-30 VDC	42-60 VDC	10.5-15 VDC	21.0-30 VDC	42-60 VDC
Input Level Indicator	Red / Orange / Green LED					
Load Level Indicator						
Failure Indicator	Red LED					
Protection	Overload, Short Circuit, Reverse Polarity (Fuse), Over / Under Input Voltage, Over Temperature.					
Safety Certification	UL458		EN60950-1			
EMC	FCC Class B		EN50081-1: 1992 EN50082-1: 1992 EN55022B: 1994 EN61000-4-2: 1995 EN61000-4-3: 1996 ENV50204: 1995		e-mark e13-020866	
Operating Temperature Range	0 - 33 ℃		0 - 40 ℃			
Storage Temperature Range	-30℃ to 70℃					
Cooling	Loading controlled cooling fan					
Dimensions	295(L) x 180(w) x 72(H) mm / 11.61(L) x 7.09(W) x 2.83(H) Inch					
Weight	2.7 kgs. / 5.4 Lbs.					

Note: The specifications are subject to change without notice.

2-3. Mechanical Drawing



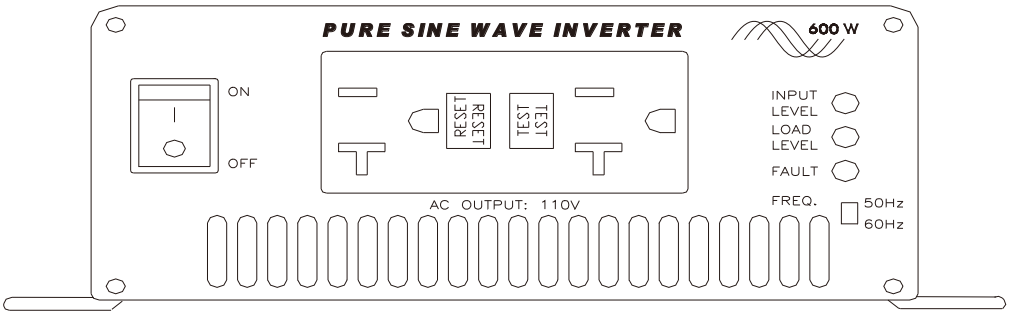
3. Instructions

This power inverter series is one of the most advanced line of mobile AC power systems.

To get the most effective power inverter, it must be installed and used properly. Please read the instructions of this manual before you install and operate this model.

3-1. Front Panel Operation：

3-1-1. Front view：



3-1-2. ON / OFF switch：

Leave the switch in the down position (OFF) during installation.

3-1-3. Input Level：Display Input Voltage

LED Status	DC 12V	DC 24V	DC 48V
Slow Red Blink	10.5~10.9	21.0~21.8	42.0~43.6
Red	10.9~11.3	21.8~22.6	43.6~45.2
Orange	11.3~12.0	22.6~24.0	45.2~48.0
Green	12.0~14.0	24.0~28.0	48.0~56.0
Orange Blink	14.0~14.7	28.0~29.4	56.0~58.8
Over Red Blink	14.7↑	29.4↑	58.8↑

3-1-4. Load Level：Display AC Load Watts

LED Status	Load Condition
Dark	0 ~ 30W
Green	30W ~ 200W
Orange	200W ~ 450W
Red	450W ~ 580W
Red Blink	Over 580W

3-1-5. Failure：Display failure status

OVP：over voltage protection

UVP：under voltage protection

OTP：over temperature protection

OLP：over load protection

3-1-6. AC outlet (Outlet Sockets available)：

North America (GFCI)

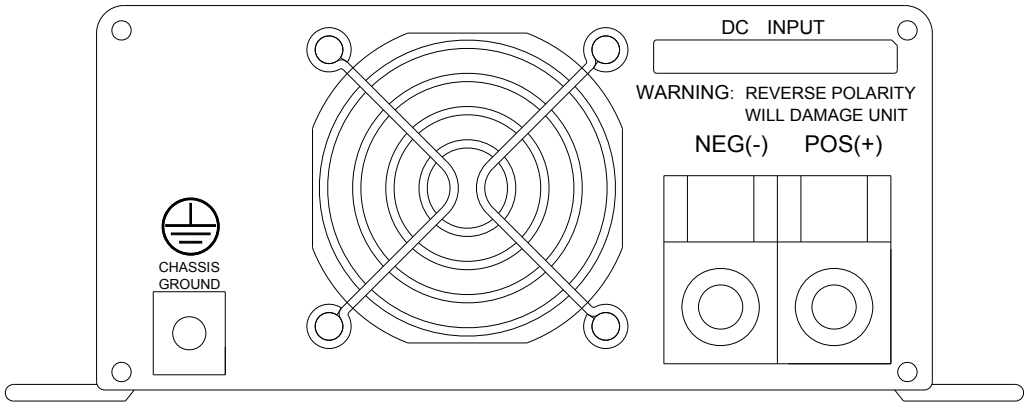
North America

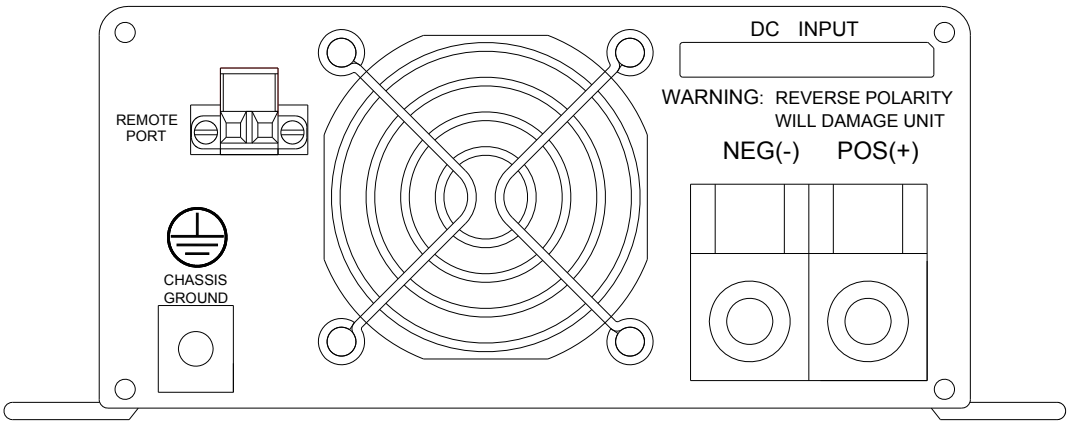
Continental Europe (SCHUKO)

Australia / New Zealand

United Kingdom

3-2. Rear Panel Operation：





3-2-1. Remote ON / OFF switch for S600R model only.

3-2-1-1. To operate the inverter with Remote ON / OFF switch, ON / OFF switch on the Front Panel should be off

3-2-1-2. Ensure the remote control contact is off.

3-2-1-3. Use 14 ~ 20 AWG wire to connect the Rear Panel Terminal marked “REMOTE PORT” to the remote control contact. If the remote control contact is in a state of low impedance (short), the inverter will be turned ON. If the remote control contact is in a state of high impedance (open), the inverter will be turned OFF.

3-2-2. Ventilation Shaft：

Be sure to keep it a distance (at least 1 inch) form surrounding things.

3-2-3. Input terminals：

Connect the input terminal to 12V / 24V / 48V battery or other 12V / 24V /48V power source.

【＋】represents positive, and【－】represents negative. Reverse polarity connection will blow the internal fuse and may damage the inverter permanently.

3-2-4. Use wire #8 AWG to connects Chassis ground with Vehicle Chassis.

WARNING!

Operating the inverter without a proper ground connection may cause an electrical safety hazard.

3-3. Installation：

The power inverter should be installed in an environment that meets the following requirements：

3-3-1. Dry – Do not allow water to drip on or enter into the inverter.

3-3-2. Cool – Ambient air temperature should be between 0℃ and 33℃, the cooler the better.

3-3-3. Safe – Do not install the inverter in a battery compartment or other areas where flammable fumes may exist, such as fuel storage areas or engine compartments.

3-3-4. Ventilated – Keep the inverter a distance (at least one inch) away from surrounding things. Ensure the ventilation shafts on the rear and the bottom of the unit are not obstructed.

3-3-5. Dust free – Do not install the Inverter in dusty environment. The dust can be inhaled into the unit when the cooling fan is working.

3-3-6. Close to batteries – Avoid excessive cable lengths. Do not install the Inverter in the same compartment as batteries.
Use the recommended wire lengths and sizes (see section 3-6).
Do not mount the inverter where it will be exposed to the gases produced by the battery. These gases are very corrosive, and prolonged exposure will damage the Inverter.

WARNING!

Shock Hazard. Before proceeding further, carefully check that the Inverter is NOT connected to any batteries, and that all wiring is disconnected from any electrical sources. Do not connect the output terminals of the Inverter to an incoming AC source.

3-4. Quick hook – up and testing：

For a quick hook – up of the power inverter to check its performance before going ahead with installation, please follow these guidelines：

3-4-1. To check its performance, unpack and inspect the power inverter the switch is OFF.

3-4-2. Connect the cables to the power input terminals on the rear panel of power inverter. The red terminal represents positive (+) and black terminal represents negative (-). Insert the cables into the terminals and clamp the nuts and the wires securely.

WARNING!

You may observe a spark when you make this connection since current may flow into charge capacitors in the power inverter.
Do not make this connection with the flammable fumes close by. Explosion or fire may occur.

WARNING!

Ensure all the DC connections are tight (torque to 9 - 10) ft-lbs, 11.7 – 13 Nm. Loose connections and overheat may result in a potential hazard.

3-4-3. Before proceeding further, carefully check that cable you have connected does tie negative terminal of inverter to the negative output power source.

CAUTION !

Reverse polarity connection will blow the fuse in inverter and may permanently damage the inverter. Damage caused by reverse polarity connection is not covered by warranty.

3-4-4. Connect the cable from the negative terminal of the inverter to the negative terminal of the power source. Make a secure connection.

3-4-5. Set the power switch to the “ON” position and the buzzer will send out beep sound at the moment the inverter will make self-diagnosis and the LED’s indicators will also appear various colors. Finally the buzzer will send out another beep sound and the input Level LED indicators will turn to “Green” color and the inverter starts working successfully.

3-4-6. Set the power switch to OFF position, the inverter stops and all the lights go Off.

3-4-7. Set power inverter switch to the ON position and turn the test load on. The inverter should supply power to the load. If you plan to accurately measure the true output r.m.s. voltage of inverter, a meter such as FLUKE 45 BECKMAN 4410 or TRIPLETT 4200 must be used.

3-5. AC Safety Grounding：

During the AC wiring installation, AC input and output ground wires are connected to the inverter. The AC input ground wire must be connected to the incoming ground from AC utility source.
The AC output ground wire should go to the grounding point for your loads (for example, a distribution panel ground bus).

3-5-1. Neutral Grounding (GFCI'S)：

3-5-1-1. **120V models**：The neutral conductor of the AC output circuit of the Inverter is automatically connected to the safety ground during inverter operation. This conforms to National Electrical Code requirements that separately derived from AC sources (such as inverters and generators) which have their neutral conductors tied to ground in the same way as the neutral conductors from the utility tied to ground at the AC breaker panel. For models configured with a transfer relay, while AC utility power is present and the Inverter is in bypass mode, this connection (the neutral of the Inverter's AC output to input safety ground) is not present so that the utility neutral is only connected to ground at your breaker panel, as required.

WARNING!

The risk of electronic shock. Use only pass and Seymour type 2091-W, ground fault circuit-interrupter receptacles. Other types may fail to operate properly when connected to this inverter equipment.

3-5-1-2. **230V models**：There is no connection made inside the Inverter from either the line or neutral conductor to safety ground.

Ground Fault Circuit Interrupters (GFCI)：

Installations in Recreational Vehicles (for North American approvals) will require GFCI protection of all branch circuit connected to the AC output of the hardwire terminal equipped with Inverter. In addition, electrical codes require GFCI protection of certain receptacles in residential installations. While the pure sine wave output of the Inverter is equivalent to the waveform provided by utilities, compliance with UL standards requires us to test and recommend specific GFCI. Thor Mftg. has tested the following GFCI – protected 20A receptacles and found that they function properly when connected to output.

WARNING!

Do not operate the power inverter without connecting it to ground. Electrical shock hazard may occur.

3-6.DC Wiring Connections：

Follow this procedure to connect the battery cables to the DC input terminals on the Inverter. The cables should be as short as possible (less than 10 feet / 3 meters ideally) and large enough to handle the required current in accordance with the electrical codes or regulations applicable to the installation.

Cables that are not an adequate gauge (too narrow) or too long will deteriorate inverter performance such as poor surge capability and frequent low-input voltage warnings and shutdowns.

These low input voltage warnings are due to DC voltage drop across the cables from the inverter to the batteries.

The linger and narrower the cables, the greater the voltage drops.

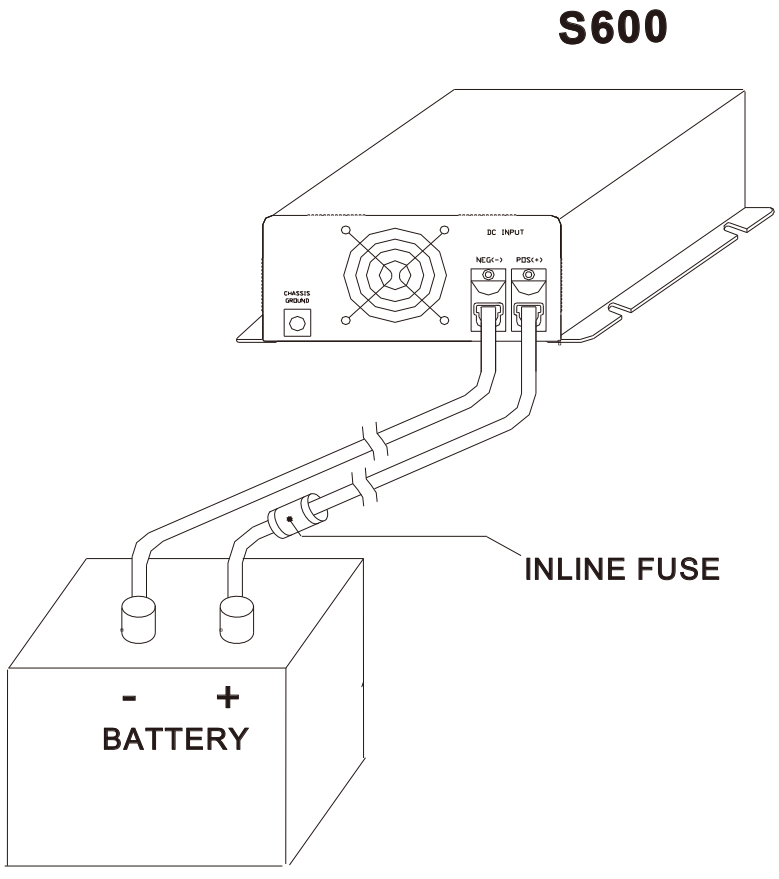
WARNING!

The fuse must be installed on positive cable.
Failure to place a fuse on “+” cables running between the inverter and battery may cause damage to the inverter and will void warranty.

Increasing DC cable size helps improve the situation. Thor Mftg. Inc. recommends the following cables for optimum inverter performance. (apply both 120V and 230V versions)

Model No	Wire AWG	Inline Fuse
THPS-600R-12	# 4	100A
THPS-600R-24	# 4	100A
THPS-600R-212	# 6	50A
THPS-600R-224	# 6	50A

Also, use only high quality copper wiring and keep cable length short, (a maximum of 3-6 feet).



3-7. Inverter Operation：

To operate the power inverter, use the ON / OFF switch on the Front panel to turn the power on. Then the power inverter is ready to deliver AC power to the loads.

If you are operating several loads from the power inverter, turn them on separately after the inverter is on.

This will ensure that the power inverter does not have to deliver the starting currents for all the loads at one time.

3-7-1. Controls and indicators：

The ON / OFF switch turns the control circuit in the power inverter on and off. It does not disconnect power from the power inverter.

The Inverter operates from an input voltage ranging of：

10.5 to 15.0 VDC for 12V models

21.0 to 30.0 VDC for 24V models

42.0 to 60.0 VDC for 48V models

The Inverter will indicate high and low DC voltage conditions as follows：

Model	Dc Input over Voltage shut-down	Dc Input under Voltage alarm	Dc Input under Voltage shut-down
THPS-600R-12	15.3	11.0	10.5
THPS-600R-24	30.6	22.0	21.0
THPS-600R-48	61.2	44.0	42.0

4. Troubleshooting：

WARNING!

Do not open or disassemble the THPS-600R Inverter. Attempting to service the unit yourself may cause an electrical shock or fire.

Problems and Symptoms	Possible Cause	Solutions
Low output voltage (110V： 95-105VAC, 220V：190-210VAC)	Using average reading Voltmeter.	Use true RMS reading meter and cable. See page 11 3-4-7. of the manual
Load LED bar flash.	Overload	Reduce load.
No output voltage Voltage indicator In the lower red zone	Low input voltage.	Recharge battery, check connections and cables.
No output voltage. Over Temp indicator on Load less than 600W	Thermal shutdown	Improve ventilation, make sure ventilation shafts of the inverter are not obstructed. Lower ambient temperature.
No output voltage Overload indicator on	Short circuit or Wiring error. Very high power load	Check AC wiring for short circuit or improper polarity (hot and neutral reversed). Remove load.

5. Maintenance：

Very little maintenance is required to keep your inverter operating properly.
You should clean the exterior of the unit periodically with a damp cloth to pre vent accumulation of dust and dirt. At the same time, tighten the screws on the DC input terminals.

6. Warranty：

We guarantee this product against defects in materials and workmanship for a period of 24 months from the date of purchase and will repair or replace any defective power inverters if you directly returned them to us with postage paid. Please note that Thor Mftg. is only responsible for ensuring our products are operational before delivering. This warranty will be considered void if the unit has been misused, altered, or accidentally damaged. Thor Mftg. is not liable for anything that occurs as a result of the user's fault.

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